within the foregoing ranges is desirable because, in the range of economically attractive operating conditions, the viscosity of the dope, *i.e.*, the solution of treated pulp from which lyocell fibers are produced, is sufficiently low that the dope can be readily extruded through the narrow orifices utilized to form lyocell fibers, yet not so low that the strength of the resulting lyocell fibers is substantially compromised. Preferably the range of D.P. values of the treated pulp will be unimodal and will have an approximately normal distribution that is centered around the modal D.P. value.

In this application, the term "without substantially increasing the copper number" means without increasing the copper number by more than about 100%, preferably not more than about 50% and most preferably not more than about 25% during the D.P. reduction step. The degree to which the copper number changes during the D.P. reduction step is determined by comparing the copper number of the pulp entering the D.P. reduction step and the copper number of the treated pulp after the D.P. reduction step. A low copper number is desirable because it is generally believed that a high copper number causes cellulose and solvent degradation during and after dissolution of the treated pulp to form a dope. The copper number is an empirical test used to measure the reducing value of cellulose. The copper number is expressed in terms of the number of milligrams of metallic copper which is reduced from cupric hydroxide to cuprous oxide in alkaline medium by a specified weight of cellulosic material.

The hemicellulose content of the treated pulp, expressed as a weight percentage, is at least 7% by weight; preferably from about 7% by weight to about 25% by weight; more preferably from about 7% by weight to about 20% by weight; most preferably from about 10% by weight to about 17% by weight. As used herein, the term "percent (or %) by weight" or "weight percentage", or grammatical equivalents thereof, when applied to the hemicellulose or lignin content of treated pulp, means weight percentage relative to the dry weight of the treated pulp.

Treated pulps of the present invention also exhibit a desirably narrow molecular weight distribution as evidenced by a differential between R_{10} and R_{18} values (ΔR) of less than about 2.8, preferably less than about 2.0, and most preferably less than about 1.5. In contrast, pulps treated in accordance with the teachings of U.S. application Serial No. 09/256,197 prior to treatment to reduce its copper number exhibits a ΔR

greater than about 2.8. After treatment to reduce the copper number in accordance with this prior application, the ΔR for the pulps of the prior application can be reduced to less than about 2.8. Sulfite pulps tend to exhibit a ΔR on the order of about 7.0 and prehydrolyzed Kraft pulps exhibit a ΔR that tends to be on the order of about 3.0. R_{10} refers to the residual undissolved material that is left after attempting to dissolve the pulp in a 10% caustic solution. R_{18} refers to the residual amount of undissolved material left after attempting to dissolve the pulp in an 18% caustic solution. Generally, in a 10% caustic solution, hemicellulose and chemically degraded short chain cellulose are dissolved and removed in solution. In contrast, generally only hemicellulose is dissolved and removed in an 18% caustic solution. Thus, the difference between the R_{10} value and the R_{18} value represents the amount of chemically degraded short chained cellulose that is present in the pulp sample. Providing a pulp having a relatively narrow molecular weight distribution is desirable from the standpoint of being able to provide customers with pulp which can be mixed with pulps of different molecular weight properties to predictably tailor the molecular weight distribution in a dope used to produce lyocell fibers. Another advantage of providing the pulp having a relatively narrow molecular weight distribution is the low concentration of short chain cellulose or hemicellulose molecules present in such pulp. Such short chain oligomer material if present, may complicate the lyocell solvent recovery process.

Without intending to be bound by theory, it is believed that the chemical form of the hemicellulose in pulps treated in accordance with the present invention is distinct from the chemical form of hemicellulose in pulps that have been exposed to acidic conditions or heterogeneous mixture conditions described above which result in the breaking of cellulose glycosidic bonds, such as the pulps described in prior application Serial No. 09/256,197 and commercially available dissolving grade pulps. This difference in chemical form may be evidenced by the D.P. of the hemicellulose in the pulp of the present invention compared to the D.P. of the hemicellulose of the pulp of the prior application or commercial dissolving grade pulps. This D.P. difference can be observed when the respective pulps are derivatized (acetylated) and tested in the accordance with the discussion by S.A. Rydholm in Pulping Processes, Interscience Publishers, 1965. The higher D.P. hemicellulose in treated alkaline pulps of the present invention may be less likely to be extracted from lyocell filaments during the filament

formation process or post treatment of the formed lyocell filament as compared to the hemicellulose of the pulps of the prior application or commercially available dissolving grade pulps.

A presently preferred method of treating pulp in order to reduce the average D.P. of the cellulose without substantially reducing the hemicellulose content of the pulp and without substantially increasing the copper number of the pulp is to treat the pulp under alkaline conditions in high consistency or medium consistency reactor(s) where the pulp is contacted with an oxidant containing a peroxide group such as oxygen, chlorine dioxide, ozone or combinations thereof. Preferably the oxidant is a combination of oxygen and hydrogen peroxide or hydrogen peroxide alone.

The treated pulps formed in accordance with the present invention which have been treated in order to reduce their average degree of polymerization values without substantially decreasing the hemicellulose content or the copper number for the pulp can be produced by contacting the pulp in reactor with an oxidant under conditions suitable to achieve the desired results described above. Suitable reactors include reactors conventionally used as oxygen reactors in a Kraft process. Examples of reactors capable of carrying out the contacting of the pulp with the oxidant are described in U.S. Patent Nos. 4,295,925; 4,295,926; 4,298,426; 4,295,927, each of which is herein incorporated by reference. Unlike conventional oxygen reactors which are configured and operated under conditions that preferably do not decrease the average degree of polymerization of cellulose while at the same time remove lignin applicants' invention is designed to operate a reactor under conditions that reduce the average degree of polymerization of the cellulose without substantially reducing the hemicellulose content or increasing the copper number of the cellulose. In accordance with the present invention, the reactor can be a high consistency reactor wherein the consistency of the feedstream to the reactor is greater than about 20% or it can be a medium consistency reactor where the consistency ranges between about 8% up to about 20%. The conditions under which a high consistency reactor or a medium consistency reactor is typically operated in order to achieve the desired results of the present invention relate primarily to operation of the high consistency reactor at a temperature that is slightly higher than the temperature at which the medium consistency reactor can be operated as described below in more detail.